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PATENT APPLICATION
Docket No. PACIF-55288

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of		)
	Johnson et al	)
Serial No.:	09/637,821	)
Confirmation No.	7950	) Appeal No.
Filed:	August 11, 2000	)
For:	Compensation System and Method for Sound Reproduction	)
Examiner:	Michalski, Justin I.	)

The Honorable Commissioner of Patents
Mail Stop Appeal Brief - Patents
P.O. BOX 1450
Alexandria, VA 22313-1450

BRIEF OF APPELLANT

The Applicant has filed a timely Notice of Appeal from the action of the Examiner in finally rejecting all of the claims that were considered in this application. This Brief is being filed under the provisions of 37 C.F.R. § 1.192. The Filing Fee, as set forth in 37 C.F.R. § 1.17(c), is submitted herewith.

REAL PARTY IN INTEREST

The real party in interest comprises Microsoft Corporation, Inc. by way of assignment from Johnson et al., who is the named inventive entity and is captioned in the present brief, to the

Microsoft Corporation, Inc. by way of an assignment document recorded at Reel/Frame 011374/0791 in the United States Patent and Trademark Office on December 11, 2000.

RELATED APPEALS AND INTERFERENCES

None.

STATUS OF CLAIMS

Claims 1-54 are pending in the application.

STATUS OF AMENDMENTS

No amendment has been filed subsequent to the Final Office Action mailed on February 23, 2004.

SUMMARY OF INVENTION

A compensation system and method for sound reproduction is described. The compensation system and method employs a plurality of filters which, either individually or in combination, exhibit individual compensation responses which simulate the frequency, time and phase responses exhibited by the various mechanical, acoustic, and electromagnetic components of the loudspeaker. By modeling the reproduction device's individual components and the characteristics of those components or groups of components, individual compensations for these characteristics can be created and manipulated parametrically. Therefore, these same compensations can be applied to additional systems having similar

components or characteristics. *See Application, page 8, lines 3-9.* For example, a parameter "mechanical resonance" describes "parts of system including panels, cones, surrounds, and domes". *Application, page 15, lines 7-8.* Thus, individual components of the speaker may be defined "instead of compiling or reducing speaker elements to create a lumped response system". *Application, page 13, lines 3-4.* The modeled individual components may therefore have corresponding compensations which can be applied to additional systems having similar components or characteristics.

(Excepts from Specification, Pages 8, 13, and 15)

ISSUES

1. Whether Claims 1-3, 5 and 6 were properly rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,953,431 to Yashima et al. (hereinafter "Yashima").

2. Whether Claims 29, 30, 32, 37-41, 45, 50 and 51 were properly rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,252,968 to Narasimhan et al. (hereinafter "Narasimhan").

3. Whether Claims 13-16, 18, 19, 21, 24 and 25 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Narasimhan.

4. Whether Claims 4, 7, 8, 17, 22, and 23 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of U.S. Patent No. 5,305,388 to Kunno et al. (hereinafter "Kunno").

5. Whether Claims 9 and 10 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of U.S. Patent No. 5,815,580 to Craven et al. (hereinafter "Craven").

6. Whether Claim 11 was properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of U.S. Patent No. 6,319,117 to Goff (hereinafter "Goff").

7. Whether Claims 12 and 26-28 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of U.S. Patent No. 5,533,120 to Staudacher (hereinafter "Staudacher").

8. Whether Claims 31, 33 and 52 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Kunno.

9. Whether Claims 34, 42, 48, 49, 53 and 54 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Craven.

10. Whether Claims 36 and 44 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Staudacher.

11. Whether Claims 35 and 43 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Goff.

12. Whether Claims 46 and 47 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Yashima.

GROUPING OF CLAIMS

There are twelve (12) separate grounds of rejection that are appealed herein.

I. First Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 102(e) directed toward pending Claims 1-3, 5 and 6 under 35 U.S.C. § 102(e) as being anticipated by Yashima, these claims stand or fall together as to this rejection.

II. Second Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 102(e) directed toward pending Claims 29, 30, 32, 37-41, 45, 50 and 51 under 35 U.S.C. § 102(e) as being anticipated by Narasimhan, these claims stand or fall together as to this rejection.

III. Third Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 13-16, 18, 19, 21, 24 and 25 under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Narasimhan, these claims stand or fall together as to this rejection.

IV. Fourth Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 4, 7, 8, 17, 22, and 23 under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Kunno, these claims stand or fall together as to this rejection.

V. Fifth Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 9 and 10 under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Craven, these claims stand or fall together as to this rejection.

VI. Sixth Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Goff.

VII. Seventh Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 12 and 26-28 under 35 U.S.C. § 103(a) as being unpatentable over Yashima in view of Staudacher, these claims stand or fall together as to this rejection.

VIII. Eighth Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 31, 33 and 52 under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Kunno such that these claims stand or fall together as to this rejection, these claims stand or fall together as to this rejection.

IX. Ninth Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 34, 42, 48, 49, 53 and 54 under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Craven, these claims stand or fall together as to this rejection.

X. Tenth Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 36 and 44 under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Staudacher, these claims stand or fall together as to this rejection.

XI. Eleventh Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 35 and 43 under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Goff, these claims stand or fall together as to this rejection.

XII. Twelfth Ground of Rejection: The grounds of the rejection based on 35 U.S.C. § 103(a) directed toward pending Claims 46 and 47 under 35 U.S.C. § 103(a) as being unpatentable over Narasimhan in view of Yashima, these claims stand or fall together as to this rejection.

ARGUMENT

First Ground of Rejection. Claims 1-3, 5 and 6 satisfy the requirements of 35 U.S.C. § 102(e) so as to be unanticipated by Yashima.

1. Speaker vs. Ducted Horn Type Speaker

In order to show the distinction of the claim element "speaker" used in each independent claim, the following explanation is given.

The recited claim element "speaker" is different from the term "ducted horn type speaker" as used in Yashima. Indeed the term "speaker" as used in Yashima itself is different from the use of the term "ducted horn type speaker" in Yashima. The ducted horn type speaker of Yashima includes a speaker and a ducted horn and therefore is used in Yashima to reference the combination. *See Yashima, Col. 1, Lines* 22-26. As such, a speaker as defined in Yashima is fundamentally different than a combination of a ducted horn and a speaker which is referenced in Yashima as a "ducted horn type speaker".

2. Yashima Teaches a Digital Filter realizing an Inverse Characteristic of a Ducted Horn, not an Individual Component of a Speaker

Yashima describes an acoustic replay device. The acoustic replay device includes a ducted horn disposed on a speaker and an audio signal processing means including a non-recursive digital filter realizing an inverse characteristic of the transfer characteristic of the ducted horn. *See Yashima, Col. 5, Lines 14-21.* With this configuration, once the characteristic of the non-recursive digital filter is set to be the inverse characteristics of the ducted horn, the acoustic radiation characteristic at the opening of the ducted horn forming the

sound source for the sound field space always matches the replay characteristic of the speaker, without regards to the type of the speaker, so that the effect of the ducted horn can be easily removed, and the acoustic signal can be radiated into the sound field space with a high fidelity, without deteriorating the characteristic of the speaker. *See Yashima, Col. 5, Lines 22-31.*

The Office asserts Yashima for disclosure of "at least one said modification filter (filter 102) simulating an individual component of the speaker (component 4)". *Final Office Action Dated February 23, 2004, Page 3.* The Applicant respectfully disagrees, "[t]ransfer function H2 within block 102 represents the inverse characteristic of the transfer characteristic of the speaker 4 alone." *Yashima, Col. 10, Lines 56-58.* H2 does not simulate a *component* of the speaker as asserted by the Examiner.

Yashima's transfer function merely describes characteristics of the speaker as a whole, as shown in the following excerpt:

> Transfer function H5 within block 201 represents the inverse characteristic of the total transfer characteristic of the speaker 4, the ducted horn 200, the acoustic resistance 300 and the space up to the listening position 5. **Transfer function H2 within block 102 represents the inverse characteristic of the transfer characteristic of the speaker 4 alone**, transfer function H3 within block 103 represents the inverse characteristic of the transfer characteristic of the ducted horn 200 alone, transfer function H6 within block 202 represents the inverse characteristic of the transfer characteristic of the acoustic resistance alone, and transfer function H4 within block 104 represents the inverse characteristic of the transfer characteristic of the acoustic space from the acoustic resistance 300 to the listening position 5. Transfer function H7 within block 203 represents the inverse characteristic of the total transfer characteristic of the ducted horn 200 and the acoustic resistance 300. The coefficient data of the non-recursive digital filter 2 is so set that the non-recursive digital filter 2 has the transfer function H7. *Yashima, Col 10, Line 52 to Col. 11, Line 4 (emphasis added).*

Thus, Yashima describes a transfer function of the speaker alone and is utilized "so that the effect of the ducted horn can be easily removed" from the speaker. *Yashima, Col 5, Lines 27-*

28. Therefore, Yashima does not model individual components of the speaker, but rather the effects of the ducted horn on the speaker. Indeed, nowhere in the submitted reference is a filter corresponding to an individual component of the speaker mentioned.

In the *Office Action Dated May 10, 2004*, the Examiner asserts the following, "Yashima discloses a ducted horn type speaker consisting of references 4, 200, 300." *Office Action Dated May 10, 2004, Page 2*. The Office, however, then asserts that "[t]he Office agrees with the applicant that reference 4 is a speaker, however, references 4, 200, and 300 combined together is still a speaker with individual components 4, 200, and 300." *Office Action Dated May 10, 2004, page 2*. This interpretation is contrary to the disclosure of Yashima , which describes a speaker 4, ducted horn 200, and acoustic resistance 300 (e.g., thin cloth covering the opening of the ducted horn) at Col. 11, Lines 5-32. It is respectfully submitted that the Examiner mistakenly equates a "ducted horn type speaker" with a "speaker" contrary to the express statements made in Yashima which define a speaker. For instance, as shown in Yashima at FIG. 4, neither the ducted horn 200 nor the acoustic resistance 300 are a part of the speaker 4. This is supported throughout Yashima, an example of which is also shown in the following excerpt:

> FIG. 36 is a diagram showing the configuration of a ducted horn type speaker, in which the speaker 4 in the conventional acoustic replay device is combined with a ducted horn 200 disposed on and attached to the speaker, e.g., in front of or on a front surface of the speaker." *Yashima, Col. 1, Lines 22-26.*

Thus, the ducted horn 200 is not a component of the speaker 4 of Yashima. Therefore, Yashima does not show a transfer function that corresponds to an individual component of the speaker.

3. **Applicant Models an Individual Component of a Speaker**

Beginning at page eight of the subject application, an exemplary model of a sonic reproduction device is described as follows:

> [T]he behavior characteristics are defined by individual or groups of individual components of the sonic reproduction device. By modeling the reproduction device's individual components and the characteristics of those components or groups of components, individual compensations for these characteristics can be created and manipulated parametrically. Therefore, these same compensations can be applied to additional systems having similar components or characteristics. *Application, page 8, lines 3-9.*

For example, at page 15 of the subject application a parameter "mechanical resonance" is recited which describes "parts of system including panels, cones, surrounds, and domes". *Application, page 15, lines 7-8.* Thus, individual components of the speaker may be modeled "instead of compiling or reducing speaker elements to create a lumped response system". *Application, page 13, lines 3-4.* The modeled individual components may therefore have corresponding compensations which can be applied to additional systems having similar components or characteristics.

4. **Claims 1-3, 5 and 6 are Not Anticipated by Yashima**

Claim 1 recites, in part, a "modification filter simulating an individual component of the speaker." The Applicant respectfully submits that the ducted horn taught by Yashima is not a component of a speaker. Therefore, a digital filter set to the inverse characteristic of the ducted horn is not "modification filter simulating an individual component of the speaker" as claimed in Claim 1. The legal significance of this distinction is seen in MPEP § 2131, "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Further, "anticipation requires the

presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim." *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)).

Since Yashima does not teach the element of a "a plurality of modification filters having modification responses that simulate the plurality of individual responses, at least one said modification filter simulating an individual component of the speaker" as recited in independent Claim 1, the Applicant respectfully asserts that in the *Final Office Action Dated February 23, 2004, Page 3*, a proper case of anticipation has not been made with respect to Claim 1 and each of the claims that dependent on Claim 1. Accordingly, Claims 1-4 and 36 satisfy the requirements of 35 U.S.C. § 102(e) so as to be unanticipated by Yashima. The Applicant respectfully requests the Board to overturn the First Ground of Rejection.

Second Ground of Rejection. Claims 29, 30, 32, 37-41, 45, 50 and 51 satisfy the requirements of 35 U.S.C. § 102(e) such that these claims are not anticipated by Narasimhan.

1. **Individual Component of a Speaker vs. Audio Signal Component**

In order to show a distinction of the claim element "individual component" used in each independent claim, the following explanation is given. The recited claim element "individual component of a speaker" is different from the term "audio signal component" as used in Narasimhan. As the claim element readily describes, the individual component is selected from the speaker. On the contrary, the audio signal component is a component of an audio signal that may be provided to a speaker or an audio signal received from a speaker, and

is not a component of the speaker itself.

2. **Narasimhan Discloses an Audio Signal Component, not an Individual Component of a Speaker**

Narasimhan describes an acoustic quality enhancement via feedback and equalization for mobile multimedia systems. During a training phase, unique frequency tones are transmitted (e.g., via speakers), and then recorded (e.g., via a microphone). Each fed-back audio frequency tone is then used to estimate the gain of the reproduction medium at that particular frequency, and the background noise parameters at that frequency are also determined. This is used to construct a set of inverse filters, so the original audio source can then be pre-filtered to produce the desired audio output. During the second phase, which is the processing phase for playing back an audio source, the audio source is decomposed into sub-bands whose center frequencies are the frequency tones used for training. In each sub-band, the **audio signal component** is pre-emphasized by the gain estimates obtained during training, and also inverse filtered using the parameter estimates obtained during training. The resulting signal is then reconstructed into a full-band signal, resulting in an actual audio output signal that is better matched to the intended audio output. *See Narasimhan, Col. 2, Lines 32-50.*

The only other use of the word "component" in the detailed description of Narasimhan is as follows:

> FIG. 4 illustrates the detailed implementation of the sub-band inverse filter 220. The filter parameters to be estimated during the training phase are the coefficients c.sup.i (0), . . . c.sup.i (N-1) for each of the M sub-band filters, where i=1, . . . , M. The input to filter is x.sup.i (n) which is one of the M sub-band components of the audio source signal X(n). Shown also are N delay elements where N is the length of the filter. N varies with the performance requirements and the processing power of computer 110. At each sampling of the source signal X(n), the components x.sup.i (n), x.sup.i

(n-1), . . . x.sup.i (n-N+1) are multiplied by corresponding coefficients c.sup.i (0), c.sup.i (1), . . . , c.sup.i (N-1). The products are then added by accumulator 221 to form the output component x.sup.i (n). The above is repeated for each of the M sub-bands, and the output components x.sup.i (n) for i=1, . . ., M, to form the final output signal which is sent to the reproduction medium to be played out. *Narasimhan, Col. 4, Lines 4-20.*

Thus, Narasimhan again teaches a component of an audio signal and not an individual component of a speaker.

3. **Applicant Models an Individual Component of a Speaker**

As previously described, the subject application describes an exemplary model of a sonic reproduction device as follows:

> [T]he behavior characteristics are defined by individual or groups of individual components of the sonic reproduction device. By modeling the reproduction device's individual components and the characteristics of those components or groups of components, individual compensations for these characteristics can be created and manipulated parametrically. Therefore, these same compensations can be applied to additional systems having similar components or characteristics. *Application, page 8, lines 3-9.*

Thus, individual components of the speaker may be modeled "instead of compiling or reducing speaker elements to create a lumped response system". *Application, page 13, lines 3-4.* The modeled individual components may therefore have corresponding compensations which can be applied to additional systems having similar components or characteristics.

4. **Claims 29, 30, 32, 37-41, 45, 50 and 51 are not anticipated by Narasimhan**

Narasimhan does not disclose, teach or suggest "at least one said filter simulating an individual component of a speaker" as claimed in Independent Claims 29 and 45, or "at least one said filter simulates an individual component of the speaker" as claimed in Independent

Claim 37. The Applicant respectfully submits that the audio signal component taught by Narasimhan is not an individual component of a speaker, but rather is a component of an audio signal. Although Narasimhan mentions a component, the component is a part of an audio signal and not an individual component of a speaker. For instance, the Office asserts that "Narasimhan discloses sub-band filters (Figure 3, references 220 which represent a sub-band frequency output response component of the reproduction medium (including the speaker as disclosed by Narasimhan) which as been detected by microphone 130." *Office Action Dated May 10, 2004, Page 2.* The Office then asserts that "[t]here is no limitation in the claims that an 'individual component of the speaker' cannot comprise of a response component of the speaker". *Office Action Dated May 10, 2004, Page 2.* The Applicant respectfully disagrees. The sub-band filters described in Narasimhan represent a sub-band frequency of an audio signal reproduced by a reproduction medium 300 which include speakers 120 and the environment in which the system is operating. *See Narasimhan, Col. 3, Lines 1-7.* Thus, the sub-band frequency is not an individual component of the speaker, but rather is a sub-band frequency component of an output of an audio signal from a speaker.

Therefore, Narasimhan does not disclose "at least one said filter simulating an individual component of a speaker" as claimed in Independent Claims 29 and 45, or "at least one said filter simulates an individual component of the speaker" as claimed in Independent Claim 37. Claims 30 and 32 are dependent claims that depend from Claim 29. Claims 38-41 are dependent claims that depend from Claim 37. Claims 50 and 51 are dependent claims that depend from Claim 45. Accordingly, Claims 29, 30, 32, 37-41, 45, 50 and 51 satisfy the requirements of 35 U.S.C. § 102(e) so as to be unanticipated by Narasimhan. The Applicant respectfully requests the Board to overturn the Second Ground of Rejection.

Third Ground of Rejection. Claims 13-16, 18, 19, 21, 24 and 25 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Yashima in view of Narasimhan.

1. **Yashima Teaches a Digital Filter Realizing an Inverse Characteristic of a Ducted Horn, not Modeling an Individual Component of a Speaker**

As previously described in relation to the First Ground of Rejection, Yashima describes a non-recursive digital filter that is set to be the inverse characteristics of the ducted horn. Thus, the acoustic radiation characteristic at the opening of the ducted horn forming the sound source for the sound field space always matches the replay characteristic of the speaker, without regards to the type of the speaker, so that the effect of the ducted horn can be easily removed, and the acoustic signal can be radiated into the sound field space with a high fidelity, without deteriorating the characteristic of the speaker. *See Yashima, Col. 5, Lines 22-31.* Thus, Yashima describes a transfer function of the speaker alone and is utilized "so that the effect of the ducted horn can be easily removed" from the speaker. *Yashima, Col 5, Lines 27-28.* Yashima does not describe modeling individual components of the speaker, but rather describes the effects of the ducted horn on the speaker.

2. **Narasimhan Teaches a Filter Unit for Processing an Audio Signal to Compensate for the Effects of a Reproduction Medium, not Modeling an Individual Component of a Speaker**

Narasimhan describes an acoustic quality enhancement via feedback and equalization for mobile multimedia systems. A microphone is used to feedback the reproduced audio source, into a processing mechanism. This processing mechanism in turn, controls subsequent

audio reproduction. The processing mechanism may operate in two phases. In the first phase, which is the training phase, the medium's characteristics will be estimated, and a set of filters is constructed, with fixed parameters. The set of filters will subsequently pre-filter the audio source, in order to equalize for the medium's characteristics, during the second phase, which is the processing phase. If necessary, the pre-filter parameters may be updated by feedback of the reproduced audio source, even after the initial training period. *See Narasimhan, Col. 2, Lines 19-31.* Thus, the processing mechanism of Narasimhan equalizes for the medium's characteristics through use of the set of filters, and does not disclose, teach, or suggest at least one filter simulating an individual component of the speaker.

3. **Applicant Discloses Modeling an Individual Component of a Speaker**

As previously described, the subject application describes an exemplary model of a sonic reproduction device in which one or more individual components of the speaker are modeled "instead of compiling or reducing speaker elements to create a lumped response system". *Application, page 13, lines 3-4.* The modeled individual components may therefore have corresponding compensations which can be applied to additional systems having similar components or characteristics.

4. **Claims 13-16, 18, 19, 21, 24 and 25 are Nonobvious over Yashima in view of Narasimhan**

Neither Yashima nor Narasimhan, nor any of the other submitted references, alone or in combination, disclose nor suggest a sound compensation system for input to a sonic

reproduction device including a speaker. The sound compensation system includes a model of the sonic reproduction device having a plurality of filters that simulate at least one of the behavioral characteristics of the sonic reproduction device. At least one of the filters simulates an individual component of the speaker.

The Office asserts Yashima for disclosure of "at least one said filter (filter 102) simulating an individual component of the speaker (component 4)". *Office Action Dated February 23, 2004, Page 6.* The Applicant respectfully disagrees. As previously described, Yashima describes a "[t]ransfer function H2 within block 102 represents the inverse characteristic of the transfer characteristic of the speaker 4 alone". *Yashima, Col. 10, Lines 56-58.* Thus, Yashima describes a speaker as a whole.

Narasimhan does not cure the defects of Yashima. For example, during a training phase described in Narasimhan, frequency tones are transmitted (e.g., via speakers), and then recorded (e.g., via a microphone). *See Narasimhan, Col. 2, Lines 30-32.* Narasimhan constructs a set of inverse filters so the original audio source can then be pre-filtered to product the desired audio output. *Narasimhan, Col. 2, Lines 38-40.* Narasimhan, however, does not disclose, teach, suggest, or mention modeling a component of the speaker. Rather Narasimhan measures the effect of a reproduction medium "which includes the speakers and environment in which the system is operating." *Narasimhan, Col. 3, Lines 5-7.* In Narasimhan, like Yashima, the output of the speaker as a whole is measured. Thus, neither Yashima nor Narasimhan, alone or in combination, disclose, teach or suggest "at least one said filter simulating an individual component of the speaker" as claimed in claim 13.

Claims 15, 16, 18, 19, 21 and 24 are dependent claims that depend directly or indirectly from independent Claim 13. Accordingly, Claims 13, 15, 16, 18, 19, 21 and 24 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Yashima in view of

Narasimhan. The Applicant respectfully requests the Board to overturn the Third Ground of Rejection.

Fourth Ground of Rejection. Claims 4, 7, 8, 17, 22, and 23 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Yashima in view of Kunno.

1. **Kunno does not Cure the Defects of Yashima**

As previously described, Yashima teaches a non-recursive digital filter that is set to be the inverse characteristics of the ducted horn "so that the effect of the ducted horn can be easily removed" from the speaker. *Yashima, Col 5, Lines 27-28.* Yashima does not teach or suggest modeling individual components of the speaker, but rather describes the effects of the ducted horn on the speaker.

Kunno describes a bass compensation circuit for use in a sound reproduction device. The bass compensation circuit is for use in a sound reproduction device, which can compensate a frequency response at desired frequencies of a low frequency range, which are necessary for music reproduction in such a way that the compensated frequency response can change against change in sound volume in a natural manner. *See Kunno, Col. 1, Lines 60-67.* Kunno does not disclose, teach, or suggest modeling an individual component of a speaker.

2. **Claims 4, 7, 8, 17, 22, and 23 are Nonobvious over Yashima in view of Kunno**

Neither Yashima nor Kunno, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claims 4, 7, and 8 are

dependent claims that depend directly or indirectly from independent Claim 1. Claims 17, 22 and 23 are dependent claims that depend directly or indirectly from independent Claim 13. The foregoing arguments presented under the First and Third Grounds of Rejection, above, in reference to the rejection of Claims 1 and 13 are hereby incorporated and directed to the rejection of Claims 4, 7, 8, 17, 22, and 23. Because Claims 4, 7, 8, 17, 22, and 23 incorporate all the limitations of the claims they respectively depend from, these claims are patentable for at least the same reasons for which Claims 1 and 13 are patentable. Accordingly, Claims 4, 7, 8, 17, 22, and 23 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Yashima in view of Kunno. The Applicant respectfully requests the Board to overturn the Fourth Ground of Rejection.

Fifth Ground of Rejection. Claims 9 and 10 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Yashima in view of Craven.

1. **Craven does not Cure the Defects of Yashima**

As previously described, Yashima teaches a non-recursive digital filter that is set to be the inverse characteristics of the ducted horn "so that the effect of the ducted horn can be easily removed" from the speaker. *Yashima, Col 5, Lines 27-28.* Yashima does not describe modeling individual components of the speaker, but rather describes the effects of the ducted horn on the speaker.

Craven describes compensating filters for a loudspeaker. The response of the loudspeaker is measured by placing the loudspeaker in an echo free environment, passing a test signal through the loudspeaker, and picking up the reproduced audio signal via a microphone.

From the signal measured by the microphone, a suitable model of the loudspeaker response is derived. From this model, the response necessary to compensate the loudspeaker is derived; in a simple case, this is merely the spectral inverse of the loudspeaker response itself. The loudspeaker is then positioned within the acoustic environment in which it is to be used, and the microphone is placed at a listener position within the environment. An electrical test signal from the test signal generator is supplied to the loudspeaker and the resulting audio signal received at the microphone is measured and stored. The microphone is then moved to another point and the process is repeated. Once sufficient measurements have been taken, the coefficient calculator calculates a room response from a combination of the stored measurements, to be jointly representative of all the points at which the measurements were taken. The coefficient calculator therefore uses the stored model loudspeaker response jointly with the combined measured response to derive the response of the acoustic environment only, eliminating the dependency upon the loudspeaker. A compensation response to substantially compensate the room response is derived, and combined with the loudspeaker compensation response. From the combined compensation response the coefficients of the digital filter to execute the combined compensation are derived and supplied to the filter for use in subsequent audio reproduction. *See Craven, Col 8, Lines 1-22.* Craven does not disclose, teach, or suggest modeling an individual component of a speaker.

2. **Claims 9 and 10 are Nonobvious over Yashima in view of Craven**

Neither Yashima nor Craven, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claims 9 and 10 are dependent claims that depend directly or indirectly from independent Claim 1. The foregoing arguments presented under the First Ground of Rejection, above, in reference to the rejection of Claim 1

are hereby incorporated and directed to the rejection of Claims 9 and 10. Because Claims 9 and 10 incorporate all the limitations of the claims they respectively depend from, these claims are patentable for at least the same reasons for which Claim 1 is patentable. Accordingly, Claims 9 and 10 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Yashima in view of Craven. The Applicant respectfully requests the Board to overturn the Fifth Ground of Rejection.

Sixth Ground of Rejection. Claim 11 satisfies the requirements of 35 U.S.C. § 103(a) such that this claim is not unpatentable over Yashima in view of Goff.

1. **Goff does not Cure the Defects of Yashima**

As previously described, Yashima teaches a non-recursive digital filter that is set to be the inverse characteristics of the ducted horn "so that the effect of the ducted horn can be easily removed" from the speaker. *Yashima, Col 5, Lines 27-28.* Yashima does not describe modeling individual components of the speaker, but rather describes the effects of the ducted horn on the speaker.

Goff describes a user interface control device, which includes five pushbutton keys arranged in a cross pattern, for the control of electronic filter parameters of an audio spectrum processor. Depression of particular keys or particular combinations of keys can be made to electronically control multiple filter parameters, some simultaneously, for different filter types depending on the filter type. The unique arrangement of the pushbutton keys facilitates operation of the various parameters for bell, notch, shelf, and pass-band audio filter types with a minimal number of control elements and minimal control area. *See Goff, Col. 3, Line 66 to*

Col. 4, Line 15. Goff does not disclose, teach, or suggest modeling an individual component of a speaker.

2. **Claim 11 is Nonobvious over Yashima in view of Goff**

Neither Yashima nor Goff, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claim 11 is a dependent claim that depends directly from independent Claim 1. The foregoing arguments presented under the First Ground of Rejection, above, in reference to the rejection of Claim 1 are hereby incorporated and directed to the rejection of Claim 11. Because Claim 11 incorporates all the limitations of Claim 1, this claim is patentable for at least the same reasons for which Claim 1 is patentable. Accordingly, Claim 11 satisfies the requirements of 35 U.S.C. § 103(a) so as to be patentable over Yashima in view of Goff. The Applicant respectfully requests the Board to overturn the Sixth Ground of Rejection.

Seventh Ground of Rejection. Claims 12 and 26-28 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Yashima in view of Staudacher.

1. **Staudacher does not Cure the Defects of Yashima**

As previously described, Yashima teaches a non-recursive digital filter that is set to be the inverse characteristics of the ducted horn "so that the effect of the ducted horn can be easily removed" from the speaker. *Yashima, Col 5, Lines 27-28*. Yashima does not describe modeling an individual components of the speaker, but rather describes the effects of the ducted horn on the speaker.

Staudacher describes acoustic feedback cancellation for equalized amplification systems. A speaker amplification system is described which incorporates an adaptable notch filter that can dynamically adapt to the feedback oscillation frequency and remove it before it is amplified above an audible level. *See Staudacher, Col. 2, Lines 32-35.* Staudacher does not disclose, teach, or suggest modeling an individual component of a speaker.

2. **Claims 12 and 26-28 are Nonobvious over Yashima in view of Staudacher**

Neither Yashima nor Staudacher, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claims 12 and 26-28 are dependent claims that depend directly or indirectly from Independent Claims 1 or 13. The foregoing arguments presented under the First and Third Grounds of Rejection, above, in reference to the rejection of Claims 1 and 13 are hereby incorporated and directed to the rejection of Claims 12 and 26-28. Because Claims 12 and 26-28 incorporate all the limitations of the claims they respectively depend from, these claims are patentable for at least the same reasons for which Claims 1 and 13 are patentable. Accordingly, Claims 12 and 26-28 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Yashima in view of Staudacher. The Applicant respectfully requests the Board to overturn the Seventh Ground of Rejection.

Eighth Ground of Rejection. Claims 31, 33 and 52 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Narasimhan in view of Kunno.

1. **Kunno does not Cure the Defects of Narasimhan**

As previously described, Narasimhan describes an acoustic quality enhancement via feedback and equalization for mobile multimedia systems. During a processing phase for playing back an audio source, the audio source is decomposed into sub-bands whose center frequencies are the frequency tones used for training. In each sub-band, the audio signal component is pre-emphasized by the gain estimates obtained during training, and also inverse filtered using the parameter estimates obtained during training. The resulting signal is then reconstructed into a full-band signal, resulting in an actual audio output signal that is better matched to the intended audio output. *See Narasimhan, Col. 2, Lines 32-50.* Thus, Narasimhan again teaches a component of an audio signal and not modeling an individual component of a speaker.

Kunno describes a bass compensation circuit for use in a sound reproduction device, which can compensate a frequency response at desired frequencies of a low frequency range in such a way that the compensated frequency response can change against change in sound volume in a natural manner. *See Kunno, Col. 1, Lines 60-67.* Kunno does not disclose, teach, or suggest modeling an individual component of a speaker.

2. **Claims 31, 33 and 52 are Nonobvious over Narasimhan in view of Kunno**

Neither Narasimhan nor Kunno, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claims 31, 33 and 52 are

dependent claims that depend directly or indirectly from Independent Claims 29 or 45. The foregoing arguments presented under the Third Ground of Rejection, above, in reference to the rejection of Claims 29 and 45 are hereby incorporated and directed to the rejection of Claims 31, 33 and 52. Because Claims 31, 33 and 52 incorporate all the limitations of the claims they respectively depend from, these claims are patentable for at least the same reasons for which Claims 29 and 45 are patentable. Accordingly, Claims 31, 33 and 52 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Narasimhan in view of Kunno. The Applicant respectfully requests the Board to overturn the Eighth Ground of Rejection.

Ninth Ground of Rejection. Claims 34, 42, 48, 49, 53 and 54 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Narasimhan in view of Craven.

1. **Craven does not Cure the Defects of Narasimhan**

As previously described, Narasimhan describes an acoustic quality enhancement via feedback and equalization for mobile multimedia systems. During a processing phase for playing back an audio source, the audio source is decomposed into sub-bands whose center frequencies are the frequency tones used for training. In each sub-band, the audio signal component is pre-emphasized by the gain estimates obtained during training, and also inverse filtered using the parameter estimates obtained during training. The resulting signal is then reconstructed into a full-band signal, resulting in an actual audio output signal that is better matched to the intended audio output. *See Narasimhan, Col. 2, Lines 32-50.* Thus, Narasimhan again teaches a component of an audio signal and not modeling an individual component of a speaker.

Craven describes compensating filters for a loudspeaker. The response of the loudspeaker is measured by placing the loudspeaker in an echo free environment, passing a test signal through the loudspeaker, and picking up the reproduced audio signal via a microphone. From the signal measured by the microphone, a suitable model of the loudspeaker response is derived. From this model, the response necessary to compensate the loudspeaker is derived; in a simple case, this is merely the spectral inverse of the loudspeaker response itself. The loudspeaker is then positioned within the acoustic environment in which it is to be used, and the microphone is placed at a listener position within the environment. An electrical test signal from the test signal generator is supplied to the loudspeaker and the resulting audio signal received at the microphone is measured and stored. Once sufficient measurements have been taken, the coefficient calculator calculates a room response. The coefficient calculator therefore uses the stored model loudspeaker response jointly with the combined measured response to derive the response of the acoustic environment only, eliminating the dependency upon the loudspeaker. *See Craven, Col 8, Lines 1-22.* Thus, Craven teaches a compensation response which compensates for the room response, and does not disclose, teach, or suggest modeling individual component of a speaker.

2. **Claims 34, 42, 48, 49, 53 and 54 are Nonobvious over Narasimhan in view of Craven**

Neither Narasimhan nor Craven, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claims 34, 42, 48, 49, 53 and 54 are dependent claims that depend directly or indirectly from Independent Claims 29, 37 or 45. The foregoing arguments presented under the Third Ground of Rejection, above, in

reference to the rejection of Claims 29, 37 or 45 are hereby incorporated and directed to the rejection of Claims 34, 42, 48, 49, 53 and 54. Because 34, 42, 48, 49, 53 and 54 incorporate all the limitations of the claims they respectively depend from, these claims are patentable for at least the same reasons for which Claims 29, 37 and 45 are patentable. Accordingly, Claims 34, 42, 48, 49, 53 and 54 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Narasimhan in view of Craven. The Applicant respectfully requests the Board to overturn the Ninth Ground of Rejection.

Tenth Ground of Rejection. Claims 36 and 44 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Narasimhan in view of Staudacher.

1. **Staudacher does not Cure the Defects of Narasimhan**

As previously described, Narasimhan describes an acoustic quality enhancement via feedback and equalization for mobile multimedia systems. During a processing phase for playing back an audio source, the audio source is decomposed into sub-bands whose center frequencies are the frequency tones used for training. In each sub-band, the audio signal component is pre-emphasized by the gain estimates obtained during training, and also inverse filtered using the parameter estimates obtained during training. The resulting signal is then reconstructed into a full-band signal, resulting in an actual audio output signal that is better matched to the intended audio output. *See Narasimhan, Col. 2, Lines 32-50.* Thus, Narasimhan again teaches a component of an audio signal and not modeling an individual component of a speaker.

Staudacher describes acoustic feedback cancellation for equalized amplification

systems. A speaker amplification system is described which incorporates an adaptable notch filter that can dynamically adapt to the feedback oscillation frequency and remove it before it is amplified above an audible level. *See Staudacher, Col. 2, Lines 32-35.* Staudacher does not disclose, teach, or suggest modeling an individual component of a speaker.

2. **Claims 36 and 44 are Nonobvious over Narasimhan in view of Staudacher**

Neither Narasimhan nor Staudacher, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claims 36 and 44 are dependent claims that depend directly or indirectly from Independent Claims 29 or 37. The foregoing arguments presented under the Third Ground of Rejection, above, in reference to the rejection of Claims 29 and 37 are hereby incorporated and directed to the rejection of Claims 36 and 44. Because 36 and 44 incorporate all the limitations of the claims they respectively depend from, these claims are patentable for at least the same reasons for which Claims 29 and 37 are patentable. Accordingly, Claims 36 and 44 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Narasimhan in view of Staudacher. The Applicant respectfully requests the Board to overturn the Tenth Ground of Rejection.

Eleventh Ground of Rejection. Claims 35 and 43 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Narasimhan in view of Goff.

1. **Goff does not Cure the Defects of Narasimhan**

As previously described, Narasimhan describes an acoustic quality enhancement via

feedback and equalization for mobile multimedia systems. During a processing phase for playing back an audio source, the audio source is decomposed into sub-bands whose center frequencies are the frequency tones used for training. In each sub-band, the audio signal component is pre-emphasized by the gain estimates obtained during training, and also inverse filtered using the parameter estimates obtained during training. The resulting signal is then reconstructed into a full-band signal, resulting in an actual audio output signal that is better matched to the intended audio output. *See Narasimhan, Col. 2, Lines 32-50.* Thus, Narasimhan again teaches a component of an audio signal and not modeling an individual component of a speaker.

Goff describes a user interface control device, which comprises of five pushbutton keys arranged in a cross pattern, for the control of electronic filter parameters of an audio spectrum processor. Depression of particular keys or particular combinations of keys can be made to electronically control multiple filter parameters, some simultaneously, for different filter types depending on the filter type. The unique arrangement of the pushbutton keys facilitates operation of the various parameters for bell, notch, shelf, and pass-band audio filter types with a minimal number of control elements and minimal control area. *See Goff, Col. 3, Line 66 to Col. 4, Line 15.* Goff does not disclose, teach, or suggest modeling an individual component of a speaker.

2. **Claims 35 and 43 are Nonobvious over Narasimhan in view of Goff**

Neither Narasimhan nor Goff, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claims 35 and 43 are dependent claims that depend directly or indirectly from Independent Claims 29 or 37. The foregoing

arguments presented under the Third Ground of Rejection, above, in reference to the rejection of Claims 29 and 37 are hereby incorporated and directed to the rejection of Claims 35 and 43. Because 35 and 43 incorporate all the limitations of the claims they respectively depend from, these claims are patentable for at least the same reasons for which Claims 29 and 37 are patentable. Accordingly, Claims 35 and 43 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Narasimhan in view of Goff. The Applicant respectfully requests the Board to overturn the Eleventh Ground of Rejection.

Twelfth Ground of Rejection. Claims 46 and 47 satisfy the requirements of 35 U.S.C. § 103(a) such that these claims are not unpatentable over Yashima in view of Narasimhan.

1. **Yashima does not Cure the Defects of Narasimhan**

As previously described, Narasimhan describes an acoustic quality enhancement via feedback and equalization for mobile multimedia systems. During a processing phase for playing back an audio source, the audio source is decomposed into sub-bands whose center frequencies are the frequency tones used for training. In each sub-band, the audio signal component is pre-emphasized by the gain estimates obtained during training, and also inverse filtered using the parameter estimates obtained during training. The resulting signal is then reconstructed into a full-band signal, resulting in an actual audio output signal that is better matched to the intended audio output. *See Narasimhan, Col. 2, Lines 32-50.* Thus, Narasimhan again teaches a component of an audio signal and not modeling an individual component of a speaker.

Yashima teaches a non-recursive digital filter that is set to be the inverse

characteristics of the ducted horn "so that the effect of the ducted horn can be easily removed" from the speaker. *Yashima, Col 5, Lines 27-28.* Yashima does not describe modeling individual components of the speaker, but rather describes the effects of the ducted horn on the speaker.

2. **Claims 46 and 67 are Nonobvious over Narasimhan in view of Yashima**

Neither Narasimhan nor Yashima, alone or in combination, disclose, teach or suggest modeling an individual component of a speaker. Additionally, Claims 46 and 47 are dependent claims that depend directly or indirectly from Independent Claim 45. The foregoing arguments presented under the Second Ground of Rejection, above, in reference to the rejection of Claim 45 are hereby incorporated and directed to the rejection of Claims 46 and 47. Because 46 and 47 incorporate all the limitations of Claim 45, these claims are patentable for at least the same reasons for which Claim 45 is patentable. Accordingly, Claims 46 and 47 satisfy the requirements of 35 U.S.C. § 103(a) so as to be patentable over Narasimhan in view of Yashima. The Applicant respectfully requests the Board to overturn the Twelfth Ground of Rejection.

CONCLUSION

The Applicant respectfully considers this application to be in condition for allowance and respectfully request the Board to overturn the final rejection and that the Examiner pass this application to allowance.

Dated this 23rd day of July, 2004.

Respectfully submitted,

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APPENDIX: CLAIMS ON APPEAL

1. (previously presented): An apparatus for modifying an electrical audio signal for input to a sonic reproduction device that includes a speaker characterized by a plurality of individual responses which in combination define an overall response for the sonic reproduction device, each individual response comprising at least one of a frequency, time, phase or transient response, said apparatus comprising:

a plurality of modification filters having modification responses that simulate the plurality of individual responses, at least one said modification filter simulating an individual component of the speaker, the modification filters for receiving the electrical audio signal, modifying the electrical audio signal and providing the electrical audio signal to the sonic reproduction device; and

a plurality of adjustable parameters, each associated with at least one of the modification filters for allowing adjustments to the responses of the modification filters;

wherein the adjustments create a plurality of individual conjugate responses, each individual conjugate response associated with at least one of the plurality of individual responses.

2. (original): The apparatus of claim 1 wherein the plurality of individual responses of the sonic reproduction device are related to at least one of mechanical, acoustic and electromagnetic behavior of the sonic reproduction device.

3. (original): The apparatus of claim 1 wherein the filters are defined by digital signal processes.

4. (original): The apparatus of claim 1 wherein the filters are defined by analog circuitry.

5. (original): The apparatus of claim 1 wherein the plurality of modification filters are non-interacting.

6. (original): The apparatus of claim 1 wherein the plurality of modification responses combine to form an overall response that is a conjugate to the overall response for the sonic reproduction device.

7. (original): The apparatus of claim 1 wherein at least one of the modification filters comprises a cut-off filter and the parameters for adjusting the frequency response of the cut-off filter comprise peak frequency, amplitude and Q parameters.

8. (original): The apparatus of claim 7 wherein the peak frequency, amplitude and Q parameters modify the frequency response of the cut-off filter in at least one of the low and high frequency ranges.

9. (original): The apparatus of claim 1 wherein at least one of the modification filters comprises a constant slope equalizer and the parameters for adjusting the frequency response of the constant slope equalizer comprise crossover frequency and boost shelf parameters.

10. (original): The apparatus of claim 9 wherein the crossover frequency and boost shelf parameters modify the frequency response of the constant slope equalizer in at least one of the low and high frequency ranges.

11. (original): The apparatus of claim 1 wherein at least one of the modification filters comprises a parametric notch filter and the parameters for adjusting the frequency response of the parametric notch filter comprise notch frequency, amplitude and Q parameters.

12. (original): The apparatus of claim 1 wherein at least one of the modification filters comprises a parametric notch-boost filter and the parameters for adjusting the frequency response of the parametric notch-boost filter comprise notch frequency, amplitude and Q parameters.

13. (previously presented): A sound compensation system for altering an electrical audio signal for input to a sonic reproduction device including a speaker and having associated behavioral characteristics, said system comprising:

a model of the sonic reproduction device having a plurality of filters that simulate at least one of the behavioral characteristics of the sonic reproduction device, each filter having an associated response that combine to define an overall response for the model, at least one said filter simulating an individual component of the speaker, each response comprising at least one of a frequency, time, phase or transient response; and

a controller that modifies the response of each of the plurality of filters to transform the filter into a conjugate filter having a responses that is conjugate to the original response of the filter.

14. (original): The system of claim 13 wherein the behavior characteristics are defined by individual components of the sonic reproduction device.

15. (original): The system of claim 13 wherein the behavioral characteristics are defined by groups of individual components of the sonic reproduction device.

16. (original): The system of claim 13 wherein the filters are defined by digital signal processes and the controller comprises a computer.

17. (original): The system of claim 13 wherein the filters are defined by analog circuits and the controller comprises adjustable circuit components.

18. (original): The system of claim 13 wherein the sonic reproduction device comprises a speaker and at least one of the plurality of filters comprises at least one associated adjustable parameter and the value of the parameter is calculated based on physical characteristics of the speaker.

19. (previously presented): The system of claim 18 wherein the physical characteristics of the speaker comprises at least one of cone and coil mass, air volume, mechanical compliance, radiating area, damping, moving mass and motor characteristics.

20. (original): The system of claim 13 wherein the sonic reproduction device comprises a speaker and at least one of the plurality of filters comprises at least one associated adjustable parameter and the value of the parameter is derived from a standard speaker model.

21. (original): The system of claim 13 wherein at least one of the plurality of filters has at least one associated adjustable parameter and the value of the parameter is determined experimentally using standard test measurements.

22. (original): The system of claim 13 wherein the controller is configured such that an adjustment in the setting of at least one other parameter.

23. (original): The system of claim 22 wherein the sonic reproduction device comprises a speaker and the one parameter that modules the at least one other parameter relates to the magnet structure and voice coil of the speaker.

24. (original): The system of claim 13 wherein the controller monitors the program conditions at the sonic reproduction device and sets at least one of the parameter values based on the program conditions.

25. (original): The system of claim 24 wherein the program conditions comprise at least one of volume control settings, program level and bass content.

26. (original): The system of claim 13 wherein one of the filters comprises a weighted compensation notch filter.

27. (original): The system of claim 26 wherein the filter comprises a single-tuned weighted compensation notch.

28. (original): The system of claim 26 wherein the filter comprises a double-tuned weighted compensation notch.

29. (previously presented): A sound system comprising:

a sonic reproduction device having associated mechanical, acoustic and electromagnetic behavioral characteristics;

a source for outputting an electrical audio signal to a model of the sonic reproduction device, the model having a plurality of filters that simulate at least one of the mechanical, acoustic and electromagnetic behavioral characteristics of the sonic reproduction device, at least one said filter simulating an individual component of a speaker of the sonic reproduction device, each filter having an associated response comprising at least one of a frequency, time, phase or transient response, the model outputting the electrical audio signal to the sonic reproduction device; and

a controller that modifies the responses of the filters to transform the model into a conjugate model having a plurality of filters with responses that comprise conjugates to the original response of the filter.

30. (original): The system of claim 29 wherein the filters are defined by digital signal processes.

31. (original): The system of claim 29 wherein the filters are defined by analog circuitry.

32. (original): The system of claim 29 wherein the plurality of filters are non-interacting.

33. (original): The system of claim 29 wherein at least one of the filters comprises a cut-off filter and modifications to the frequency response of the cut-off filter comprise adjustments to peak frequency, amplitude and Q.

34. (original): The system of claim 29 wherein at least one of the filters comprises a constant slope equalizer and modifications ot the frequency response of the constant slop equalizer comprise adjustments to crossover frequency and boost shelf.

35. (original): The system of claim 29 wherein at least one of the filters comprises a parametric notch filter and modifications to the frequency response of the parametric notch filter comprise adjustments to notch frequency, amplitude and Q.

36. (original): The system of claim 29 wherein at least one of the filters comprises a parametric notch-boost filter and modifications to the frequency response of the parametric notch-boost filter comprise adjustments to notch frequency, amplitude and Q.

37. (previously presented): A method for modifying an electrical audio signal for input to a sonic reproduction device having a speaker and characterized by a plurality of individual responses which in combination define an overall response for the sonic reproduction device, each individual response comprising at least one of a frequency, time, phase or transient response, said method comprising the steps of:

simulating the plurality of individual responses with a plurality of filters, wherein at least one said filter simulates an individual component of the speaker;

adjusting the responses of the plurality of filters such that, for each filter, the adjusted response comprises a response that is a conjugate to one of the individual responses; and

inputting the electrical audio signal to the filters.

38. (original): The method of claim 37 wherein the plurality of individual responses of the sonic reproduction device are related to at least one of a mechanical, acoustic and electromagnetic behavior of the sonic reproduction device.

39. (original): The method of claim 37 wherein the plurality of filters are non-interacting.

40. (original): The method of claim 37 wherein the plurality of adjusted responses combine to form an overall response that is a conjugate to the overall response for the sonic reproduction device.

41. (original): The method of claim 37 wherein at least one of the filters comprises a cut-off filter and the step of adjusting the frequency response of the cut-off filter comprises the step of setting at least one of peak, frequency, amplitude and Q.

42. (original): The method of claim 37 wherein at least one of the filters comprises a constant slope equalizer and the step of adjusting the frequency response of the constant slope equalizer comprises the step of setting at least one of crossover frequency and boost shelf.

43. (original): The method of claim 37 wherein at least one of the filters comprises a parametric notch filter and the step of adjusting the frequency response of the parametric notch filter comprises the step of setting at least one of notch frequency, amplitude and Q.

44. (original): The method of claim 37 wherein at least one of the filters comprises a parametric notch-boost filter and the step of adjusting the frequency response of the parametric notch-boost filter comprises the step of setting at least one of notch frequency, amplitude and Q.

45. (previously presented): A method of altering an electrical audio signal for input to a sonic reproduction device having a speaker and associated behavior characteristics, said method comprising the steps of:

simulating at least one of the behavioral characteristics of the sonic reproduction device with a plurality of filters, at least one said filter simulating an individual component of the speaker, each

filter having an associated response comprising at least one of a frequency, time, phase or transient response; and

for each of the filters, modifying the response of the filter to transform the filter into a conjugate filter having a response that comprises a conjugate to the original response of the filter.

46. (original): The method of claim 45 wherein the behavioral characteristics are defined by individual components of the sonic reproduction device.

47. (original): The method of claim 45 wherein the behavioral characteristics are defined by groups of individual components of the sonic reproduction device.

48. (original): The method of claim 45 wherein the sonic reproduction device comprises a speaker and at least one of the plurality of filters ahs at least one associated adjustable parameter and the step of modifying the response of the filter comprises the steps of:

calculating the value of the at least one adjustable parameter value based on the physical characteristics of the speaker; and

setting the parameter to the calculated value.

49. (previously presented): The method of claim 48 wherein the physical characteristics of the speaker comprises at least one of cone and coil mass, air volume, mechanical compliance, radiating area, damping, moving mass and motor characteristics.

50. (original): The method of claim 45 wherein the sonic reproduction device comprises a speaker and at least one of the plurality of filters has at least one associated adjustable parameter and the step of modifying the response of the filter comprises the steps of:

deriving the at least one adjustable parameter from a standard speaker model; and

setting the parameter to the derived value.

51. (original): The method of claim 45 wherein at least one of the plurality of filters has at least one associated adjustable parameter and the step of modifying the response of the filter comprises the steps of:

determining the at least one adjustable parameter experimentally using standard test measurements; and

setting the parameter to the determined value.

52. (original): The method of claim 48, 50 or 51 further comprising the step of modulating the setting of at least one parameter in response to the setting of another parameter.

53. (original): The method of claim 48, 50 or 51 further comprising the steps of:

monitoring at least one program condition at the sonic reproduction device; and

setting at least one of the parameter values based on the at least one program condition.

54. (original): The method of claim 53 wherein the program conditions comprise at least one of volume control setting, program level and bass content.

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FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 330.00

Complete if Known	
Application Number	09/637,821
Filing Date	Aug 11, 2000
First Named Inventor	Johnson
Examiner Name	MICHALSKI, JUSTIN I
Art Unit	2644
Attorney Docket No.	MS1-846US

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JUL 2 9 2004
Technology Center 2600

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account:

Deposit Account Number: 12-0769

Deposit Account Name: Lee & Hayes, PLLC

The Director is authorized to: *(check all that apply)*

☑ Charge fee(s) indicated below ☑ Credit any overpayments

☑ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 0.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	Fee Paid
Total Claims	-20** =		X	=
Independent Claims	- 3** =		X	=
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	330
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 330.00

SUBMITTED BY

Name (Print/Type)	William J. Breen, III	Registration No. (Attorney/Agent)	45,313	Telephone (509) 324-9256
Signature				Date 7/23/04

(Complete *(if applicable)*)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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